

**NOTE:** 10/30/08 - Administratively changed to reflect the new MESC, ISC, and KISS contract operations.

## **KENNEDY NASA PROCEDURAL REQUIREMENTS**

**Effective Date:** February 28, 2007

**Expiration Date:** February 28, 2012

**Responsible Office:** Center Operations

---

## **KSC RESPIRATORY PROTECTION PROGRAM**

---

National Aeronautics and  
Space Administration

John F. Kennedy Space Center

## **TABLE OF CONTENTS**

### **PREFACE**

- P.1 Purpose
- P.2 Applicability
- P.2 Authority
- P.4 Applicable Documents
- P.5 Cancellation/Supersession

### **CHAPTER 1. Responsibilities**

- 1.1 Heads of Primary Organizations
- 1.2 The KSC Occupational Medicine Officer
- 1.3 Technical Training
- 1.4 The MESC Industrial Hygiene Office
- 1.5 The KSC Industrial Hygiene Officer
- 1.6 The Respiratory Protection Panel
- 1.7 The ISC Life Support
- 1.8 Civil Service Line Management and Contract Employers
- 1.9 Individual Employees

### **CHAPTER 2. Respiratory Protection Program**

- 2.1 General
- 2.2 Written Operating Procedures
- 2.3 Respiratory Protective Equipment
- 2.4 Breathing Escape Units
- 2.5 Respirator Care and Maintenance\
- 2.6 Breathing Air
- 2.7 Health Hazard Evaluation
- 2.8 Medical Screening and Surveillance Examinations
- 2.9 Employees Training and Respirator Fit Testing
- 2.10 Records

### **APPENDIX A. Definitions**

- APPENDIX B.** Table 1 – Assigned Protection Factors
- Table 2 – Compressor Breathing Air Evaluations

## PREFACE

### P.1 PURPOSE

a. Kennedy NASA Procedural Requirements (KNPR) contains the requirements for the implementation of the Kennedy Space Center (KSC) Respiratory Protection Program. It provides both general and specific requirements for protective measures to be taken for employees who may be exposed to toxic air contaminants and oxygen deficient atmospheres. This KNPR does not in any way relieve various NASA organizations and their associated contractors of responsibility for the protection of personnel under their cognizance.

b. It is KSC policy to provide employees with an environment in which occupational health hazards are identified, evaluated, eliminated or controlled in such a manner that personnel do not suffer adverse health effects as a result of their employment. Activities shall be conducted in a manner that conforms to all applicable federal, state and local regulatory requirements. Personnel exposures to chemical and/or physical agents shall at all times be restricted to levels as low as reasonably achievable.

c. The requirements presented in this KNPR implement Federal Occupational Safety and Health Administration (OSHA) regulations and NASA management policy for industrial hygiene programs. NASA and contractor management and operations organizations will supplement the provisions of this Directive by implementation of internal policies and instructions, as needed.

d. Additional requirements for the KSC Industrial Hygiene Program are contained within [KNPD 1800.2, KSC Hazard Communication Program](#); [KNPR 1820.3, KSC Hearing Loss Prevention Program,](#) and [KNPR 1840.19, KSC Industrial Hygiene Programs.](#)

### P.2 APPLICABILITY

This KNPR applies to all NASA organizational elements located at the Kennedy Space Center (KSC), and NASA/KSC facilities and operations at other locations; including associated contractor, to the extent specified in their respective contracts; carrier and payload organizations; and other Government agencies, their contractors, and tenants located at the Kennedy Space Center.

### P.3 AUTHORITY

a. Title 29, [Code of Federal Regulations \(CFR\)](#), Part 1960.b. Executive Order 12196, Occupational Safety and Health Programs for Federal Employeesc. [NPD 1820.1, NASA Environmental Health Program](#)d. [NPR 8715.1, NASA Occupational Safety and Health Programs](#)

#### **P.4 APPLICABLE DOCUMENTS**

- a. Title 29 [CFR](#), 1910.94, 1910.134, 1910.139, and 1910.1000 - End
- b. Title 42 [CFR](#) Part 84
- c. Privacy Act of 1974 (5 USC 522. (i)(1))
- d. [KNPR 8715.3, NASA Safety Practices and Procedural Requirements](#)
- e. [KNPD 1800.1, KSC Hazard Communication Program](#)
- f. [KNPR 1840.19, KSC Industrial Hygiene Programs](#)
- g. KBM-ST-2.1A, Medical Standards for the John F. Kennedy Space Center and Cape Canaveral Air Force Station
- h. Air Force Occupational Safety and Health Standard 48-137, February 10, 2005, Respiratory Protection Program
- i. ANSI/CGA G-7.1- 2004, Commodity Specification for Air
- j. ANSI/CGA C-7-2004, Guide to the Preparation of Precautionary Labeling and Marking of Compressed Gas Containers
- k. ANSI Z88.2-1992, American National Standard for Respiratory Protection
- l. Federal Specification BB-A-1034B, Compressed Air, Breathing
- m. American Conference of Governmental Industrial Hygienists, Threshold Limit Values for Chemical Substances and Physical Agents and Biological Exposure Indices (current edition)
- n. National Institute for Occupational Safety and Health (NIOSH), Guide to Industrial Respiratory Protection
- o. U.S. Air Force technical Order 42B-1-22, February 27, 2004, Quality Control of Compressed and Liquid Breathing Air

#### **P.5 CANCELLATION/SUPERSESSON**

This document supersedes KNPR 1820.4, Rev. A., KSC Respiratory Protection Program.

Michael J. Benik  
Director, Center Operations

Distribution: TechDoc Library

## CHAPTER 1: RESPONSIBILITIES

1.1 Heads of Primary Organizations and Heads of Contractor Organizations to the extent provided by their contracts shall:

- a. Provide operational implementation of the requirements of this KNPR.
- b. Ensure personnel:
  - (1) Are notified of hazards and protective measures governing work with hazardous chemical agents.
  - (2) Are provided appropriate training and orientation to identify hazards associated with chemical agents in their work places and to use respiratory protective equipment provided for their safety.
  - (3) Are notified of any changes or modifications to systems used to control exposure to these agents.
- (c) Implement and maintain control measures required preventing or otherwise reducing employee potential exposure to hazardous chemical agents.
- d. Observe applicable provisions of [KNPR 1840.19, KSC Industrial Hygiene Programs](#) and [KNPD 1800.2, KSC Hazard Communication Program](#).
- e. Ensure assessment plans, processes, and operations are reviewed for elimination or control of air contaminant hazards.
- f. Designate organization representatives to the KSC Respiratory Protection panel.

1.2 The KSC Occupational Medicine Officer, or his/her designated representative, shall:

- a. Provide medical evaluations to personnel identified by their organizations as respirator users.
- b. Provide medical screening and surveillance examinations for those employees who may be occupationally exposed to certain hazardous chemical agents, as required by 29 [CFR](#) Part 1910, 29 [CFR](#) Part 1926, and/or other applicable NASA/USAF requirements.
- c. Provide, on a case by case basis, special physical evaluations to personnel identified as being exposed or potentially exposed to hazardous chemical agents as the result of an accident, mishap, or other unusual circumstance.

d. Ensure that physical examination criteria as defined in KBM-ST-2.1A is implemented to conform to the protocols defined by OSHA, where required, and other nationally recognized standards as applicable.

e. Maintain records of all Occupational Medicine activities associated with support to the KSC Respiratory Protection Program as defined by Federal Regulation; i.e., OSHA, NASA Health Standards.

f. Provide employee access to medical records in accordance with 29 [CFR](#) 1910.1020 and the Privacy Act of 1974, as amended (5 USC 522.a).

1.3 The KSC Industrial Hygiene Officer, or his/her designated representative, shall implement and administer the KSC Respiratory Protection Program for NASA Civil Service personnel.

1.4 The Medical and Environmental Health Services (MESC) Industrial Hygiene (IH) Office shall:

a. Provide baseline surveys of operations, tasks, or procedures, which possess the potential to create harmful air contamination.

b. Provide Health Hazard Evaluations of operations, tasks, or procedures where baseline surveys have shown the presence of harmful air contaminants at concentrations, which may pose a health hazard to personnel.

c. Provide area and/or personal exposure monitoring which represent the exposure of employees where previous surveys have shown the presence of air contaminants at concentrations in excess of the action level.

d. Provide the Occupational Medicine Officer or his designated representative access to exposure monitoring records.

e. Provide to supervisors, site managers, or responsible safety organizations in the affected work area:

(1) Results of surveys and recommendations.

(2) Recommended methods for the control or elimination of air contaminant hazards.

(3) Requirements for employees to participate in the Respiratory Protection Program.

(4) Recommendations on the selection of respiratory protective equipment.

f. Notify employers of exposure monitoring results for affected employees.

g. Review facility plans and operational procedures to assess the adequacy of precautions taken to control workplace air contaminants.

h. Provide technical assistance in the selection and design of engineering controls and work practices used to control or eliminate air contaminants.

- i. Perform inspections of breathing air compressors and associated air filtration systems.
- j. Chair the KSC Respiratory Protection Panel.
- k. Advise and assist in development of Respiratory Protection Program Training courses.

1.5 The Respiratory Protection Panel (RPP) serves as a government/contractor forum for the implementation of respiratory protection programs. Membership consists of the KSC IH Officer, designated representatives of NASA and resident KSC contractor organizations representing; Occupational Medicine, Environmental Health, Life Support, Fire Services, Safety, and Training, as well as each contractor respiratory protection program administrator. The panel shall:

- a. Provide consultative services to KSC Management and contractors on items related to respiratory protection.
- b. Coordinate actions to resolve problems or rectify deficiencies in the selection, use, and maintenance of respirators.
- c. Provide a forum for discussion and resolution of issues related to industrial hygiene, life support, occupational medicine, fire, and training services provided by NASA to its contractors in support of their respiratory protection programs.
- d. Assist the KSC IH Officer in the development and maintenance of respiratory protection policies, requirements, and general practices of the KSC Respiratory Protection Program.
- e. Coordinate permanent deployment/removal of Breathing Escape Units as outlined in Chapter 2, paragraph 2.4.

1.6 Technical Training. The Kennedy Institutional Support Services (KISS) Technical Training Office, or other contractor training organizations shall, to the extent provided by contract, provide respirator fit testing, training and certification, and maintain associated employee training and certification records.

1.7 The Institutional Services Contract (ISC) Life Support Organization shall:

- a. Service all respirators assigned to Life Support to include inspection, testing, cleaning, sanitizing, repair, and refilling of cylinders and maintain records of all elements performed.
- b. Act as the main point of procurement initiation and issuance for supplied air respiratory protective devices in coordination with the KSC IH Officer and Propellants and Life Support Sustaining Engineering.

- c. Perform periodic preventive maintenance procedures on all assigned respirators and maintain records of these inspections on a recurring basis at frequencies determined by Life Support Systems and Sustaining Engineering as detailed in Operational Maintenance Requirements and Specifications Documents (OMRSD's).
- d. Ensure appropriate manufacturer's certification for Life Support technicians who perform respirator maintenance. Ensure periodic recertification to maintain and upgrade technicians' capabilities. Maintain records of all such training, certification and recertification.
- e. Prepare and update as required, Operation and Maintenance Instructions (OMIs) for the use, servicing, and repair of all used respirators in accordance with OMRSDs and manufacturers' recommendations.
- f. Provide consultative support to the KSC Respiratory Protection Panel on all aspects of respiratory protective equipment.
- g. Provide training with information and documentation relative to changes in procedures or configuration of respiratory protective equipment that could affect the respiratory training program.

1.8 Civil Service Line Management and Contract Employers shall:

- a. Coordinate with appropriate safety and environmental health personnel to request workplace health hazard assessment of operations with suspected air contaminant generation.
- b. Develop written operations specific requirements for the use of respiratory protection equipment, as identified in the health hazard evaluation.
- c. Ensure that there is proper completion and submittal of KSC Forms: 16-539, KSC/CCAFS Respirator Usage Questionnaire (completed by employer); 16-540, KSC/CCAFS Respirator Medical Evaluation Questionnaire (completed by employee) and 13-116, Physical Examination Request/Report Form, which are required for the medical evaluation.
- d. Ensure employees who have a medical evaluation by a Physician or other Licensed Health Care Professional (PLHCP) outside of the KSC/CCAFS Occupational Medicine Services shall have the appropriate documentation on file with their employer that states conformity and compliance with OSHA's medical evaluation guidelines.
- e. Ensure that employees seeking certification to use respiratory protective equipment are medically certified to use such equipment and attend, Respiratory Protection Program training, and respirator fit testing, as required.
- f. Ensure that employees are provided with the proper visual correction devices that are compatible with proper and effective respirator use, when visual correction has been determined necessary by the PLHCP.
- g. Attend the Respiratory Protection Program training provided for their employees.
- h. Verify that employees are issued the correct type and size respirator for which they have been fitted and certified.



- i. Ensure the proper use of respiratory protection equipment, engineering controls, and work practices established to reduce workplace exposure to harmful air contaminants.
- j. Ensure that employees are not assigned to tasks requiring the use of respirators when they have facial hair, scars, missing dentures, etc., which have the potential for causing leakage in the sealing surface of the respirator.
- k. Notify their affected employees of the results of Health Hazard Evaluations and exposure monitoring surveys, as defined in Section 2.7 of this KNPR.
- l. Ensure the proper care and maintenance of respirators issued to their employees.
- m. Maintain a current list of employees having respirator use certifications.
- n. Review work assignments/work area hazards to determine potential need for use of respiratory protection equipment.
- o. When respiratory protection must be worn for protection from hazardous materials, review Material Safety Data Sheets for those materials with the affected employees.

p. Assist in the development of strategies to control or eliminate exposure to hazardous air contaminants.

1.9 Individual Employees shall:

a. Use control procedures established to maintain air contaminant control, including wearing and maintaining respiratory protective devices, as instructed.

b. Cooperate with supervisory, medical, environmental health and safety personnel in activities to evaluate and control air contaminant hazards.

c. Notify supervisors of areas, operations, or equipment that may be a source of air contaminants.

d. Report any suspected chemical exposures to their supervisors.

e. Complete a KSC/CCAFS Respirator Medical Evaluation Questionnaire Form (KSC Form 16-540) and submit to Occupational Medicine for evaluation.

f. Notify supervisors of changes in their health status that may affect their ability to safely use respiratory protection and resubmit the KSC Form 16-540.

## CHAPTER 2: RESPIRATORY PROTECTION PROGRAM

### 2.1 General

This Section establishes guidelines for the use of respiratory protective equipment. These guidelines establish practices and procedures where the use of such equipment is required to perform tasks that are inherently hazardous because of the presence of toxic air contaminants and/or oxygen deficient atmospheres. These guidelines are applicable to all NASA civil service and contractor organizations as well as their subcontractors. Mandatory requirements for compliance with the OSHA Respiratory Protection Standard are not repeated in this KNPR, but may be found in 29 [CFR](#) 1910.134.

### 2.2 Written Operating Procedures

Operating procedures that require the use of respiratory protective equipment are considered hazardous and must meet the requirements of [KNPR 8715.3](#), Attachment B.

### 2.3 Respiratory Protective Equipment

a. Adequate respiratory protection shall be provided whenever.

(1) Personnel are required to work in hazardous atmospheres where the action level of the hazardous air contaminant is exceeded or oxygen deficient atmospheres are present.

(2) Personnel are involved in the handling, transfer, or use of hazardous chemicals where the toxicity of the chemical is of such a nature as to place those personnel at significant risk of serious illness or injury in the event of a leak, spill, or other release of the chemical.

(3) Personnel are required to enter atmospheres which have unknown concentrations of oxygen and/or air contaminants.

(4) An Industrial Hygienist or Safety Professional determines that personnel exposure(s) could exceed the action level.

b. The selection of respiratory protection equipment shall take into consideration:

(1) The nature of the hazard(s) associated with the operation or process;

(2) The nature of the work operation or process;

(3) The physical and chemical properties and additive effects of the air contaminant(s); (additional general considerations are sorbent efficiencies, odor warning properties, irritation potential, and lower flammability limit);

(4) The adverse health effects of the air contaminant(s);

(5) Warning properties of the hazardous air contaminant(s);

(6) The relevant Occupational Exposure Limits (OEL);

(7) The measured concentration(s) of hazardous air contaminant(s);

(8) Worker activities in the area of the operation and the potential stress of work conditions on employees wearing the respirators;

(9) The period of time respiratory protection shall be worn by employees during the work shift;

(10) The physical characteristics, functional capabilities, and limitations of the respirator; and

(11) The substance specific OSHA standard.

c. Selection of appropriate respiratory protection equipment shall take into account the Assigned Protection Factor (APF) for each type of respirator as listed in the Appendix B and OSHA specific substance standards. When using a combination respirator (e.g., airline respirators with an air-purifying filter), employers must ensure that the assigned protection factor is appropriate to the mode of operation in which the respirator is being used.

d. Maximum Use Concentration (MUC):

(1) The employer shall select a respirator for employee use that maintains the employee's exposure to the hazardous substance, when measured outside the respirator, at or below the MUC.

(2) Employers shall not apply MUCs to conditions that are immediately dangerous to life or health (IDLH); instead, they shall use respirators listed for IDLH conditions in 29 [CFR](#) 1910.134 (d) (2) (ii)

(3) When the calculated MUC exceeds the IDLH level for a hazardous substance, or the performance limits of the cartridge or canister, then employers shall set the maximum MUC at that lower limit.

e. For selection and use limitations of particulate respirators, consult 42 [CFR](#) Part 84.

## 2.4 Breathing Escape Units

a. Breathing Escape Units (BEUs) are required in work areas where:

(1) A potential exists for the rapid development of an Immediately Dangerous to Life or Health (IDLH) atmosphere, and

(2) There is no immediate means for the affected employees to egress the IDLH area to a safe atmosphere.

b. Requests for permanent deployments/removal of BEUs will be made to the KSC Respiratory Protection Panel. The Panel will make an evaluation as to whether the above criteria are met. The Panel will appoint a team to evaluate the request. The evaluation team will include representatives of:

(1) The responsible contractor Safety and Health Organization (Team Lead, responsible for coordinating the assessment)

(2) NASA Safety

(3) Life Support

(4) Environmental Health

(5) The requesting organization

c. On completion of the evaluation, the Chair of the KSC Respiratory Protection Panel shall prepare a written report for concurrence by the members of the evaluation team. The report shall:

(1) Evaluate the toxic properties of the hazardous commodities in question.

(2) Evaluate accident scenarios in which an IDLH atmosphere could rapidly develop.

(3) Identify operations in the affected area and the number of employees potentially exposed to the hazardous condition.

(4) Identify the availability of rapid egress routes for affected employees to take in the event of an emergency and time required for the egress.

(5) List other mitigating factors, as applicable.

d. Upon distribution of the report, Life Support shall provide recommended BEUs based upon availability. The requesting organization is responsible for coordinating with Life Support for the deployment/removal of BEUs.

e. It is the responsibility of the requesting organization to revise all documentation (e.g., OMI, KPRD, and Facility Drawings) needed to assure the proper scheduling and deployment of the requested BEUs. When additional BEUs are required, but are not available for support from the existing Life Support inventory, it is the responsibility of the requesting organization to coordinate their procurement and maintenance with NASA Center Operations and Life Support.

## 2.5 Respirator Care and Maintenance

Cleaning and disinfection of respirators will be in accordance with 29 [CFR](#) 1910.134, Appendix B-2.

## 2.6 Breathing Air

a. Compressed breathing air shall meet the requirements in 29 [CFR](#) 1910.134 paragraph (i).

b. Testing of compressor-supplied breathing air shall be in accordance with Table 2 in the Appendix B.

## 2.7 Health Hazard Evaluation

a. An initial Health Hazard Evaluation of potentially hazardous operations shall be conducted when any information, observation, or calculation shows that an employee may be exposed to oxygen-deficient atmospheres and/or air contaminants above their action levels. This includes, but is not limited to, data from monitoring of similar operations, procedure reviews, potential for skin and eye contact, and employee complaints of unusual odors, irritations, or other signs or symptoms of potential exposures.

(1) The Health Hazard Evaluation shall evaluate and describe:

- (a) the operation, process, and/or equipment generating the air contaminant(s),
- (b) their approximate concentrations,
- (c) other operations in the area,
- (d) the number of potentially exposed employees,
- (e) the duration and frequency of the exposure,
- (f) respiratory protection requirements, including applicable respirator filter cartridge change out schedule,
- (g) associated Personal Protective Equipment (PPE), and
- (h) any regulatory requirements applicable to the operation.

(2) Health hazard evaluations shall be repeated annually, or whenever any changes to facilities, equipment, work practices, procedures, and/or engineering control measures are made.

b. Employees and/or their representatives shall be provided an opportunity to observe area and personal exposure monitoring.

c. Results of Health Hazard evaluations shall be posted in the affected employees' work areas or otherwise provided to affected employees for their review.

## 2.8 Medical Screening and Surveillance Examinations

a. Medical evaluation is required for every employee who is to be assigned to tasks requiring the use of respiratory protective equipment.

b. Specific requirements for medical evaluation are defined in 29 [CFR](#) 1910.134, Appendix C, or as otherwise directed by the Occupational Medicine Officer.

c. For employees who are not resident at KSC, the Occupational Medicine Officer may accept an already existing medical examination or written opinion from a licensed physician stating whether the employee has any detected medical condition which would place the employee's health at increased risk from respirator use and any recommended limitations on the use of respirators.

## 2.9 Employee Training and Respirator Fit Testing

a. Respirator training and fit testing shall be in accordance with 29 [CFR](#) 1910.134.

b. Upon completion of fit testing and verification of employees' medical certifications, each employee shall be issued a certification card (KSC Form 31-81NS or 28-627NS) which identifies the employee, and the manufacturer(s), model(s), size(s), expiration date, protection factor(s) of the respirator(s), and fit tester's initials for which the employee has been fit tested.

c. Qualitative (QLFT) and quantitative (QNFT) fit tests shall be performed only by qualified individuals specifically trained and assigned responsibility for providing respirator fit tests.

d. Fit-test results shall be related to Assigned Protection Factors as follows:

- (1) Half-mask, air-purifying respirators may be worn in atmospheres no greater than 10 times the established exposure limit, when the respirator user passes the qualitative fit test; or when the respirator user passes a quantitative fit test with a minimum fit factor of greater than 100.
- (2) Full-facepiece, air-purifying respirators may be worn in atmospheres no greater than 50 times the established exposure limit when the respirator user passes a quantitative fit test with a minimum fit factor greater than 500.
- (3) Powered air-purifying respirators and supplied-air respirators with tight-fitting facepieces require fit testing. They may be used in atmospheres no greater than allowed by the Assigned Protection Factor for that respirator listed in the Appendix B.

#### 2.10 Records

- a. Access to employee exposure and medical records shall be in accordance with 29 [CFR](#) 1910.1020 and the Privacy Act of 1974, as amended (5 USC 522.a). Employee exposure and medical records shall be maintained in accordance with the requirements of 29 [CFR](#) 1910.1020.
- b. Copies of this KNPR, 29 [CFR](#) 1910.134 (OSHA Respiratory Protection Standard), other applicable OSHA regulations, and any appropriate records required by this KNPR shall be provided, upon request, to employees, former employees, representatives of employees, representatives of the U.S. Department of Labor, and NASA Headquarters personnel. Copies of this KNPR and other current NASA issuance's are available electronically at the [KSC Business World](#) web site under KSC Directives.



## APPENDIX A. Definitions

A.1 Action Level: A measured airborne concentration of an air contaminant that is equal to one-half the Occupational Exposure Limit for the contaminant, or other concentration where specified by OSHA substance-specific standard.

A.2 Adequate warning properties: Detectable characteristics of a hazardous air contaminant including odor, taste, and/or irritation effects that are detectable and persistent at concentrations at or below the Occupational Exposure Limit and do not cause olfactory fatigue.

A.3 Assigned Protection Factor: Assigned protection factor (APF) means the workplace level of respiratory protection that a respirator or class of respirators is expected to provide to employees when the employer implements a continuing, effective respiratory protection program as specified by this section.

A.4 Demand: A mode of operation for supplied air respirators in which air flows into the respirator only when inspiration creates a lower pressure within the facepiece than the ambient atmospheric pressure.

A.5 Filtering Facepiece (Dust Mask): A negative pressure particulate respirator with a filter as an integral part of the facepiece or with the entire facepiece composed of the filtering medium.

A.6 Maximum Use Concentration (MUC): The maximum use concentration means the maximum atmospheric concentration of a hazardous substance from which an employee can be expected to be protected when wearing a respirator, and is determined by the assigned protection factor of the respirator or class of respirators and the exposure limit of the hazardous substance. The MUC can be determined mathematically by multiplying the assigned protection factor specified for a respirator by the required OSHA permissible exposure limit, short-term exposure limit, or ceiling limit. When no OSHA exposure limit is available for a hazardous substance, an employer must determine an MUC on the basis of relevant available information and informed professional judgment.

A.7 Occupational Exposure Limit: The more stringent of:

- (1) the Permissible exposure level (PEL) for the hazardous chemical as listed in 29 [CFR](#) Part 1910, Subpart Z; or
- (2) the Threshold Limit Value (TLV) for the hazardous chemical assigned by the American Conference of Governmental Industrial Hygienists (ACGIH) in the latest edition of "Threshold Limit Values for Chemical Substances and Physical Agents in the Work Environment"; or
- (3) a NASA Permissible Exposure Level when published as a NASA Health Standard;

(4) where there is no PEL, TLV or NASA standard for the chemical, an exposure level based on available published scientific information such as Material Safety Data Sheets.

A.8 Resident: an employee who is employed by a Federal or contractor organization that is a tenant of Kennedy Space Center or the Cape Canaveral Air Force Station (KSC/CCAFS).

A.9 Respirator: Any device worn by an individual and intended to provide the wearer with respiratory protection against inhalation of airborne contaminants or oxygen deficient atmospheres.

A.10 User Organization: Any NASA, contractor, or tenant organization at KSC/CCAFS who calibrates air sampling equipment, performs air sampling, and/or provides for the analysis of air samples for industrial hygiene purposes.

## APPENDIX B. Tables

<b>Table 1 -- Assigned Protection Factors<sup>9</sup></b>					
Type of respirator <sup>1,2</sup>	Quarter mask	Half mask	Full facepiece <sup>5</sup>	Helmet/hood	Loose-fitting facepiece
Air-Purifying Respirator <sup>3</sup>	5	10 <sup>4</sup>	50	--	--
Powered Air-Purifying Respirator (PAPR)	--	50	1,000	25/1,000 <sup>4</sup>	25
Supplied-Air Respirator (SAR) or Airline Respirator <sup>6,7</sup>					
Demand mode	--	10	50	--	--
Continuous flow mode	--	50	1,000	25/1,000 <sup>8</sup>	25
Pressure-demand or other positive- pressure mode	--	50	1,000	--	--
Self-Contained Breathing Apparatus (SCBA)					
Demand mode	--	10	50	50	--
Pressure-demand or other positive- pressure mode (e.g., open/closed circuit)	--	--	10,000	10,000	--

Notes:

- Employers may select respirators assigned for use in higher workplace concentrations of a hazardous substance for use at lower concentrations of that substance, or when required respirator use is independent of concentration.
- The assigned protection factors in Table 1 are only effective when the employer implements a continuing, effective respirator program as required by this section (29 [CFR](#) 1910.134), including training, fit testing, maintenance, and use requirements.
- Air-purifying respirators may not be used in oxygen deficient atmospheres.
- This APF category includes filtering facepieces, and half masks with elastomeric facepieces.
- Only full-facepiece respirators are to be used in contaminant concentrations that produce eye irritation.
- Any supplied-air respirator may be used in an oxygen deficient atmosphere where the oxygen content is above the oxygen deficient IDLH limits.
- Only a full facepiece pressure demand SCBA or combination full facepiece pressure demand SAR with auxiliary self-contained air supply may be used in unknown IDLH or oxygen deficient IDLH atmospheres.
- The employer must have evidence provided by the respirator manufacturer that testing of these respirators demonstrates performance at a level of protection of 1,000 or greater to receive an APF of 1,000. This level of performance can best be demonstrated by performing a WPF or SWPF study or equivalent testing. Absent such testing, all other PAPRs and SARs with helmets/hoods are to be treated as loose-fitting facepiece respirators, and receive an APF of 25.

9. These APFs do not apply to respirators used solely for escape. For escape respirators used in association with specific substances covered by 29 [CFR](#) 1910 subpart Z, employers must refer to the appropriate substance-specific standards in that subpart. Escape respirators for other IDLH atmospheres are specified by 29 [CFR](#) 1910.134.

**TABLE 2**

<b>COMPRESSOR BREATHING AIR EVALUATIONS</b>			
COMPRESSOR TYPE	CO ALARM	HIGH TEMP ALARM	EVALUATE
OIL LUBRICATED	Yes	Yes	90 Days
	Yes	No	90 Days
	No	Yes	45 Days
	No	No	45 days
OIL-FREE	Yes	Yes	90 Days
	Yes	No	90 Days
	No	Yes*	90 Days
	No	No	45 Days

\*Auto shutoff device installed. Historic evaluations are satisfactory.